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*Feature*

# *Visualizing Volcano Data Gives Scientists New Perspective*

When the film "Dante's Peak" opened this February, movie goers got a look at a volcanic eruption—Hollywood style. The film's volcano in the Pacific northwest is fictional, but the Jet Propulsion Laboratory's (JPL) Digital Image Animation Laboratory (DIAL) creates volcano movies—from scientific data—that are anything but fictional.

Data used to create these visualizations come from a variety of remote sensing missions, including the Spaceborne Imaging Radar-C/X-band Synthetic Aperture Radar (SIR-C/X-SAR), the Airborne Synthetic Aperture Radar (AIRSAR), Airborne Visible and Infrared Imaging Spectrometer (AVIRIS), the Airborne Emission Spectrometer (AES), and the Thermal Infrared Multispectral Scanner (TIMS). The DIAL visualizes such scientific data through 3D animations, ranging from simple use of color to combine data sets to more complex simulated flights through the data. The many visualizations of the Earth's volcanoes include Mount Ranier, the Long Valley caldera in the Mammoth Mountains of California, Mauna Loa, Mount Pinatubo and Taal in the Philippines, Mount Etna near Sicily, and the trans-Mexican volcanic belt. The most recent addition to this series is a simulated flight over Mount St. Helens that was created by combining TIMS data with a high-resolution digital elevation model..

***Imaging radar***

In recent months, AIRSAR, AES, and TIMS were part of a cadre of scientific instruments onboard a NASA DC-8 aircraft that captured images of the Manam volcano within hours of an eruption on an island off the north coast of Papua, New Guinea. Ellen O'Leary, the AIRSAR science coordinator at JPL, stated that airborne instruments allow mapping of topography and changes in topography from a safe distance, as in the case of Manam.

Imaging radar is a particularly useful tool for studying volcanoes because the radar is able to see through the weather and volcanic clouds," said Jeff Plaut, JPL's SIR-C experiment scientist. " It's a good tool for mapping new volcanic deposits because of the radar's sensitivity to texture such as ash and different types of lava flows. Understanding the eruptive process helps us know where lava will flow, and that has a bearing on the hazards that are posed to nearby communities."

James Garvin, chief scientist for the Shuttle Laser Altimeter at Goddard Space Flight Center explained that combining the radar data with information from scanning laser altimeters allows scientists to track

changes and then document the impact of erosion, climate, and other factors on the topography and stability of large volcanoes.

Vince Realmuto, JPL's TIMS experiment scientist and supervisor of the Visualization and Earth Science Applications Group, stated that thermal infrared data is used to study volcanoes in three ways: by mapping ground temperatures, which scientists can relate to geothermal phenomena; mapping variations in the composition of lava flows; and mapping the sulfur dioxide in volcanic plumes.

TIMS data are useful for studying volcanoes because thermal infrared remote sensing is the only practical means of obtaining virtually instantaneous maps of dynamic phenomena such as the distribution of temperatures on the ground or sulfur dioxide in a plume," he said. "Such data are of great use in monitoring volcanoes, where changes in ground temperatures or sulfur dioxide emission can signal impending activity."

Scientists use data from these ongoing missions to prepare for future volcanic studies. For example, TIMS is a precursor to the Advanced Spaceborne Thermal Emission and Reflection Radiometer, which is scheduled to fly on the first Earth Observing System (EOS) satellite in 1998. AES is a precursor to the Tropospheric Emission Spectrometer, scheduled for launch aboard the EOS CHEM-1 platform in 2002.

***Data visualization***

The DIAL turns scientific data into 3D video animations, and other images, to give scientists new views on how volcanoes are changing. Realmuto, speaking as the DIAL supervisor, said, "the basic objectives of data visualization are to give scientists new perspectives into complex data sets and to permit them to communicate their findings in a format that is both compelling and accessible."

*Excerpted from the JPL Universe article, "Animation lab turns volcano data into 3D movies for researcher" and NASA press release 97-25, written by Mary Hardin, JPL.*